REMARKS

This amendment is being filed in response to the Final Office Action having a mailing date of May 22, 2003. Claims 1, 5, 8, 13, and 15 are amended as shown. The applicants believe that these amendments place the claims in better condition for allowance and clarify distinctive features which have already been previously presented to and discussed with the Examiner, and therefore may be entered and considered by the Examiner without requiring a new search. No new matter has been added. With this amendment, claims 1-20 remain pending in the application.

In the Final Office Action, the Examiner continued to maintain the rejections of independent claims 1, 8, and 15 primarily on the basis of Shiau (U.S. Patent No. 5,353,127) under either 35 U.S.C. § 102(b) or 35 U.S.C. § 103(a). More specifically, the Examiner has argued that the claim limitations introduced in the prior-filed amendment are still met by Shiau. See, *e.g.*, page 5, ¶ 6 of the Final Office Action. That is, the Examiner has stated that with regards to claim 1: "While the claim recites one preceding pixel, it is noted that Shiau discloses that the error for the current pixels are computed from the evaluation of pixels (n, l-1), (n+1, l-1), (n+2, l-1), (n+3, l-1), and (n-1, l) (see lines 2-8 of column 6 and Fig. 2). Therefore, to compute the error for any pixel in the first line, *i.e.* l=1, the error for the pixel would be the error of pixel (n-1, 1), or the one preceding pixel." See, *e.g.*, page 5, ¶ 6 of the Final Office Action. The applicants agree with this analysis, and thank the Examiner for pointing out and carefully considering this section of Shiau in view of what is recited in claim 1.

However, in Shiau, this relationship where the error for a current pixel is the error of one preceding pixel is only true for the pixels of the <u>first row</u> of the image. The Examiner has acknowledged this fact in the Final Office Action by stating that the error for any pixel in the <u>first line</u> (*i.e.*, l=1) is the error for one preceding pixel. That is, Shiau uses four pixels to compute the correction term. Three of these pixels are present in a previous row (l-1) above the row of the current pixel, while the fourth pixel is the previous pixel in the same row as the current pixel. Therefore, for the error of Shiau to be computed based <u>on only the preceding pixel</u> while the contribution of three pixels above the current pixels are ignored, the current pixel must only be present in the first row. For calculation of errors for any other current pixel in other

rows, Shiau needs to use the evaluation of four surrounding pixels, and does not solely rely on the single preceding pixel.

According to one embodiment of the invention, and which is in sharp contrast to what is disclosed by Shiau, the error of each pixel of the image (and therefore for each pixel of each row of the image) is based on the error of the preceding pixel. This was the claim limitation that the applicants attempted to argue in the prior amendment of March 18, 2003, but perhaps was not as clearly or precisely recited as it had to be. As clearly discussed and disclosed in the present application, a correction term for each current pixel in each row is based upon an error of a single one of a preceding pixel. For the first pixel of each row, one embodiment provides a correction term of null, since there is no pixel that precedes the first pixel of each row.

There is nothing in Shiau that discloses, teaches, or suggests modifying its correction and distribution scheme so as to keep only the error of pixel (n-1, 1) (*i.e.*, only the single previous pixel) for the correction term of each pixel of each row of the image. As discussed above, this single preceding pixel relationship only applies to the first row of pixels of Shiau, while other pixels in other rows are required to use error values from four surrounding pixels.

Accordingly, claim 1 has been amended to clarify the distinctions over Shiau. First, claim 1 is amended to recite that the digital image is formed of several pixel rows and pixel columns. Next, claim 1 is amended to recite that the correction term for each pixel of each row of the digital image after a first pixel of each row is equal to a smallest error calculated upon approximation of one preceding pixel. These are features that are not disclosed, taught, or suggested by Shiau, since Shiau bases its correction term on only the single preceding pixel for only pixels of the first row of its image, as compared to the amended recitations of claim 1 where the correction term for each pixel of each row after the first pixel of each row is based on a smallest error calculated from one preceding pixel. Accordingly, amended claim 1 is now in allowable form.

Independent claim 8 is amended to recite that pixels of the digital image are arranged in rows and columns. Further amendments to claim 8 recite that a correction term for each pixel of each row after a first pixel of each row is also equal to an error value computed for

a previous single one of the pixels multiplied by a selected weighting coefficient for a current pixel. This is not a feature that is found in Shiau, since Shiau discloses use of a correction term for a previous single one of the pixels for only a first row of pixels of the digital image, as compared to what amended claim 8 now recites. Accordingly, amended claim 8 is now in allowable form.

Independent claim 15 is amended to recite that the pixels of the digital image are arranged in rows and columns. Claim 15 is also further amended to recite obtaining a correction term, for each current pixel of each row after the first pixel of each row, that is based on a computed error value of a single one of the pixels previous to the current pixel. This is a feature that clarifies the distinction over Shiau, since Shiau does not base its correction term on an error value computed for a single one of the pixels previous to the current pixel for each pixel of each row after the first pixel of each row. Accordingly, claim 15 is also now in allowable form.

In the Final Office Action, the Examiner further rejected various claims that recite a variable weighting coefficient or a weighting coefficient that depends on the position of the current pixel in the image. For instance, on page 8, ¶ 10 of the Final Office Action, the Examiner noted that the combination of Shiau and Yamada does not disclose a weighting coefficient that is a function of least significant bits of binary codes representing an abscissa and an ordinate of the position of the current pixel. However, the Examiner stated that this is known in the art as taught by Matsushiro, and argued that it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Shiau and Yamada into Matsushiro. Furthermore on page 15 of the Final Office Action, the Examiner stated that Shiau teaches calculation of the correction term with a variable weighting coefficient that depends on the position of the current pixel in the image.

The applicants respectfully disagree with these conclusions. Shiau uses at least four weighting coefficients for each current pixel (n,l), or (X,Y) using the notation of the applicants' invention. Shiau uses, for example, (col. 6, lines 2-19) a weighting coefficient of 0.125 for the error of pixel (X-2, Y+1) of 0.125 for the error of pixel (X-1, Y+1), of 0.25 for the error of pixel (X, Y+1) and of 0.5 for the error of pixel (X-1, Y). These four values do not vary with X or Y. For each current pixel (X,Y), an embodiment of the applicants' invention uses one

weighting coefficient for the error of pixel (X-1, Y). The value of this weighting coefficient varies with X and Y. In the example on page 7, line 19 to page 8, line 6, the weighting coefficient is: 0.25 if X and Y are even, 1 if X is even and Y is odd, 0.75 if X is odd and Y is even, and 0.5 if X and Y are odd.

Thus, while Matsushiro may disclose some type of use of X and Y coordinate information, there is no motivation or suggestion to combine these teachings with Shiau or Yamada. Shiau strictly uses weighting coefficients that are predetermined and preassigned, and are not intended to vary with X or Y. Since Shiau uses four surrounding pixels to compute the correction value, adding a variable value that changes with X and Y will simply increase the complexity and number of calculations needed to achieve a computed value. Accordingly, a person skilled in the art would not seek to combine the added computations of the variable coordinates of Matsushiro with the system of Shiau or Yamada. It would be much more simple and practical for a person of ordinary skill in the art to use fixed values, and thereby reduce the number of computations, as is done in Shiau, for example. Accordingly, dependent claims 2 and 10, as well as independent claims that recite or imply a variable nature of the weighting coefficient are also allowable.

Overall, none of the references singly or in any motivated combination disclose, teach, or suggest what is recited in the independent claims. Thus, given the above amendments and accompanying remarks, the independent claims are now in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

If the undersigned attorney has overlooked a teaching in any of the cited references that is relevant to the allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact the undersigned attorney at (206) 622-4900.

The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.
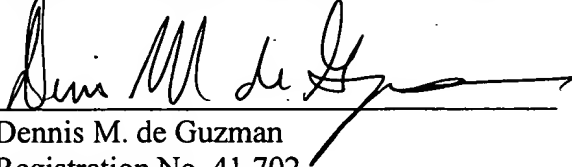
11

Based upon the above remarks, applicants respectfully request favorable reconsideration of this application and its early allowance.

Respectfully submitted,

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